

Figure 1

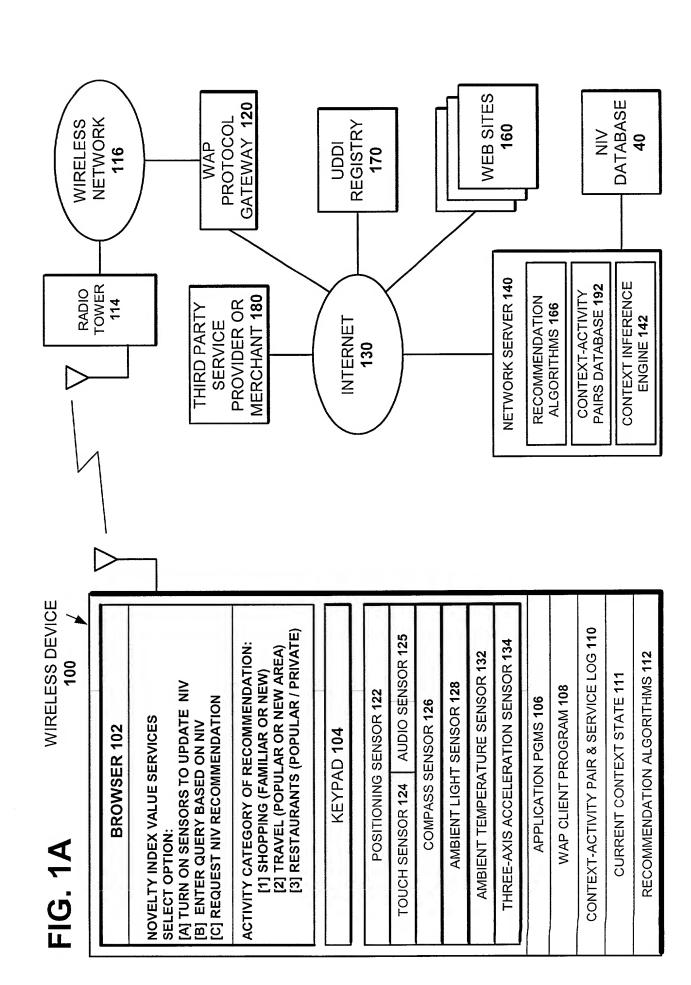
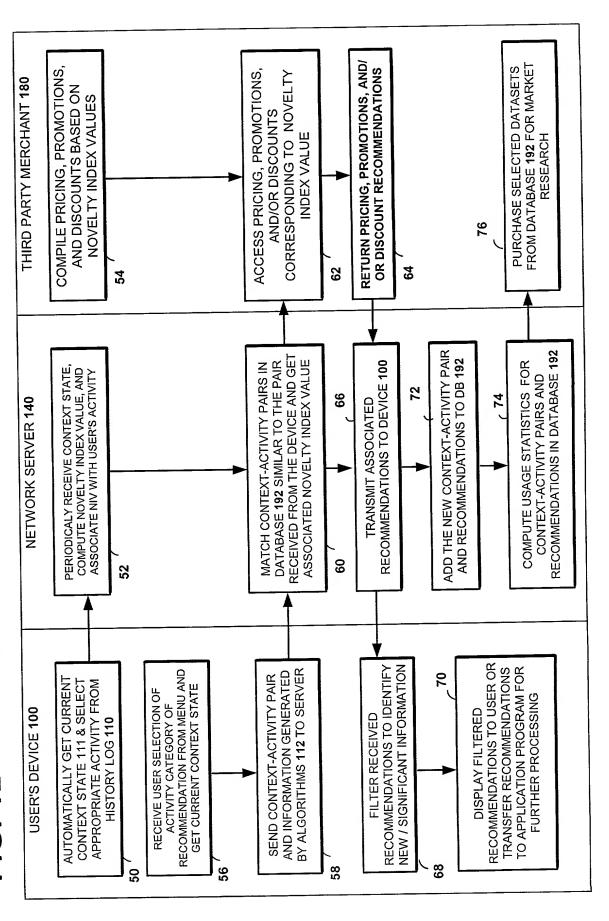
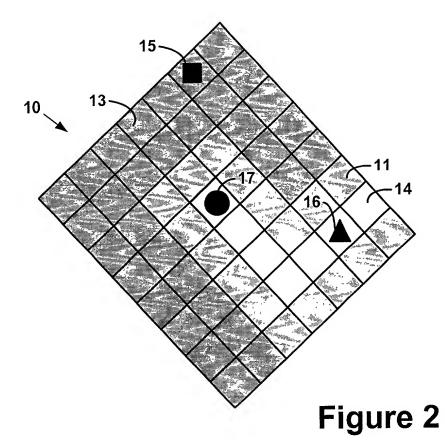
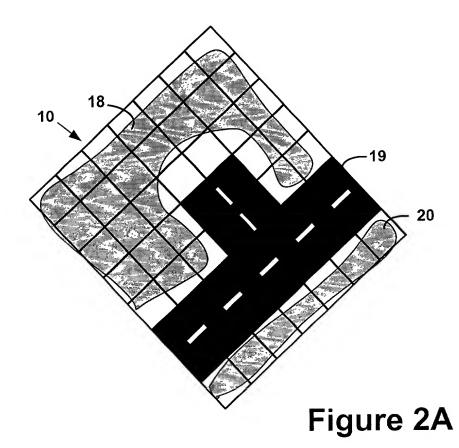


FIG. 1B

NIV-DATA GATHERING AND NIV-BASED RECOMMENDATIONS







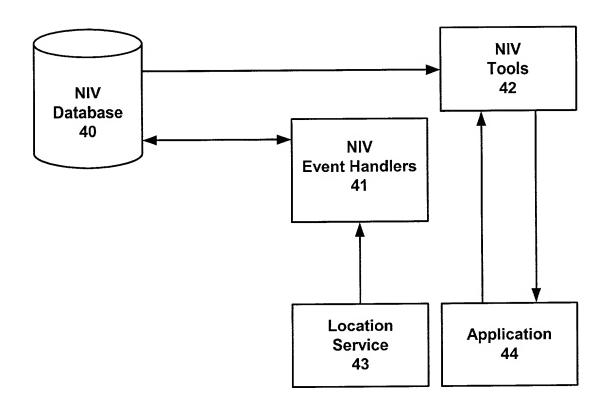


Figure 3

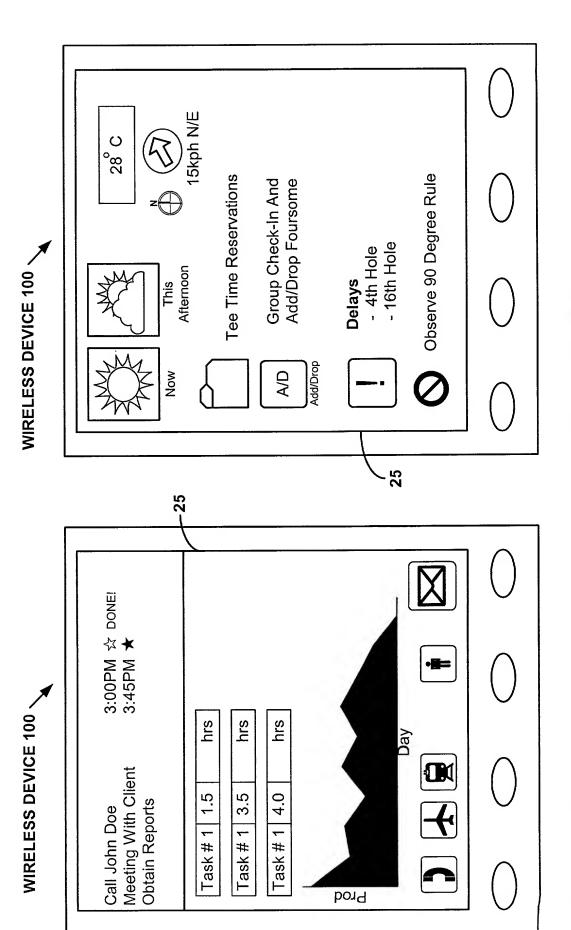
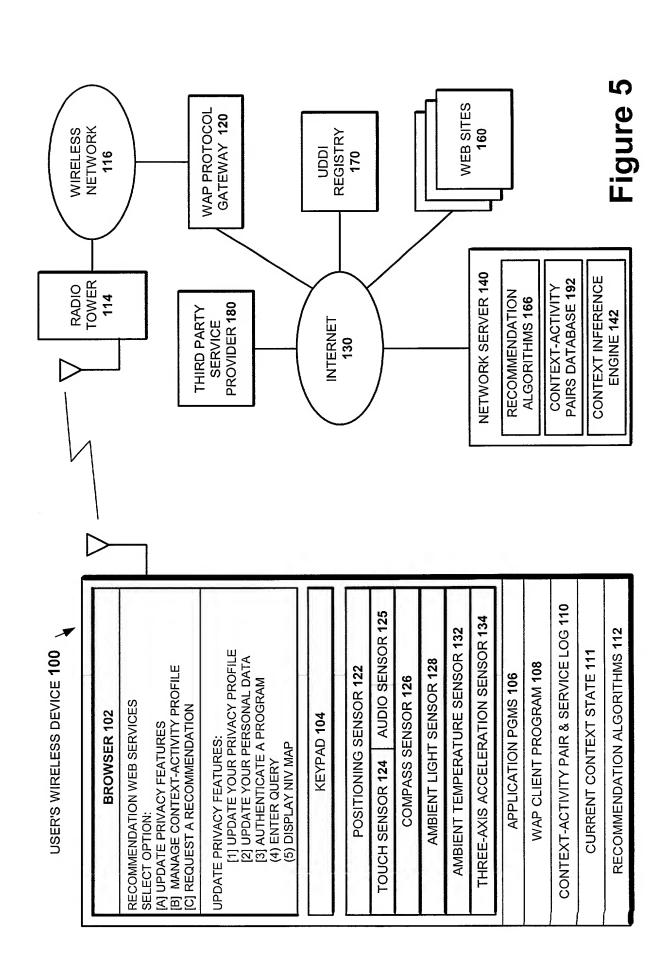


Figure 4

Figure 4A



USER'S WIRELESS DEVICE 100 **BROWSER 102 User Context-Activity** Log DB 149 148 KEYPAD 104 **POSITIONING SENSOR 122 AUDIO SENSOR 125 TOUCH SENSOR 124** COMPASS SENSOR 126 AMBIENT LIGHT SENSOR 128 **AMBIENT TEMPERATURE SENSOR 132** THREE-AXIS ACCELERATION SENSOR 134 **APPLICATION PGMS 106** WAP CLIENT PROGRAM 108 CONTEXT-ACTIVITY PAIR & SERVICE LOG 110 **CURRENT CONTEXT STATE 111 RECOMMENDATION ALGORITHMS 112**

Figure 6

USER'S WIRELESS DEVICE 100

BROWSER 102

UPDATE PRIVACY FEATURES:

[1] UPDATE YOUR PRIVACY PROFILE

[a] Add a local program to permissions list
[b] Remove a local program from list
[c] Add a server program to permissions list
[d] Remove a server program from list
[e] Add a network program to permissions list
[f] Remove a network program from list

[2] UPDATE YOUR PERSONAL DATA

[a] Update server database [b] Update network database

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6A

USER'S WIRELESS DEVICE 100

BROWSER 102

UPDATE PRIVACY FEATURES:

[3] AUTHENTICATE A PROGRAM

a] Request program's public key certificate

[b] Verify certificate signatures

[c] Verify validity time

[d] Verify revocation status

[e] Check if certificate authority is on trust list [f] Flag program as authenticated

[4] REGISTER A PROGRAM

[a] When can the accesses take place [b] What data can be accessed

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6B

USER'S WIRELESS DEVICE 100

BROWSER 102

MANAGE CONTEXT-ACTIVITY PROFILE:

[1] AUTOMOBILE

- [a] day time radio preferences[b] night time radio preferences[c] map display preferences[d] service station preferences

[2] DINING

- [a] restaurant preferences [b] food preferences

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6C

USER'S WIRELESS DEVICE 100

BROWSER 102

MANAGE CONTEXT-ACTIVITY PROFILE:

[3] ENTERTAINMENT

[a] movie preferences [b] sports preferences

[4] TRAVEL

[a] weather forecasts[b] airline preferences[c] hotel preferences[d] car rental preferences

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6D

USER'S WIRELESS DEVICE 100,

BROWSER 102

REQUEST A RECOMMENDATION:

[1] AUTOMOBILE ACTIVITIES

[a] request day time radio recommendation [b] request night time radio recommendation [c] request map recommendation [d] request service station recommendation

[2] DINING ACTIVITIES

[a] request restaurant recommendation [b] request food recommendation

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6E

USER'S WIRELESS DEVICE 100

BROWSER 102

REQUEST A RECOMMENDATION:

[3] ENTERTAINMENT ACTIVITIES

[a] request movie recommendation [b] request sports recommendation

[4] TRAVEL ACTIVITIES

[a] request weather forecasts [b] request airline recommendation

[c] request hotel recommendation

[d] request car rental recommendation

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6F

USER'S WIRELESS DEVICE 100 \

BROWSER 102

ACTIVITY: DINING - restaurant CONTEXT:

LOCAL TIME: 2001/05/08/8:00 PM

LOCATION: Beale Street, Memphis, TN

LIGHT LEVEL - Street Lights /Night

AMBIENT TEMPERATURE - 22 C

SPEED - ACCELERATION - 0

SERVICE RECOMMENDATIONS:

Joe's Beef Barbecue Restaurant

Elvis' Place

The Blues Diner

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6G

USER'S WIRELESS DEVICE 100

BROWSER 102

ACTIVITY: DINING - restaurant CONTEXT:

LOCAL TIME: 2001/06/08/7:30 AM

LOCATION: Beale Street, Memphis, TN

LIGHT LEVEL - Daylight

AMBIENT TEMPERATURE - 16 C SPEED - ACCELERATION - 0

SERVICE RECOMMENDATIONS: Pancake Restaurant

Betty's Homestyle Breakfast **Great Start Diner**

KEYPAD 104

POSITIONING SENSOR 122

TOUCH SENSOR 124

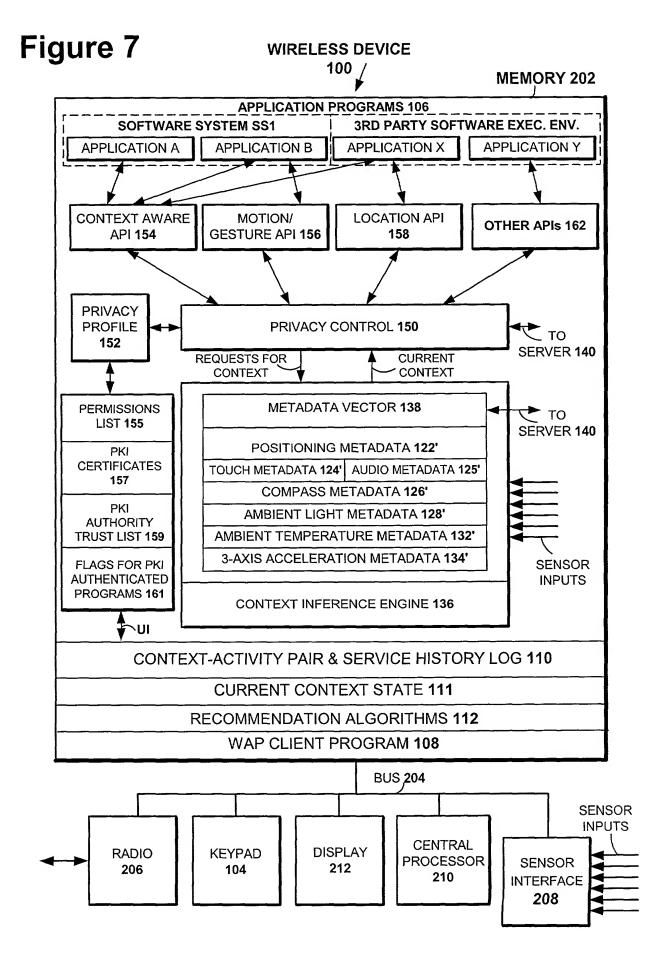
COMPASS SENSOR 126

AMBIENT LIGHT SENSOR 128

AMBIENT TEMPERATURE SENSOR 132

THREE-AXIS ACCELERATION SENSOR 134

Figure 6H



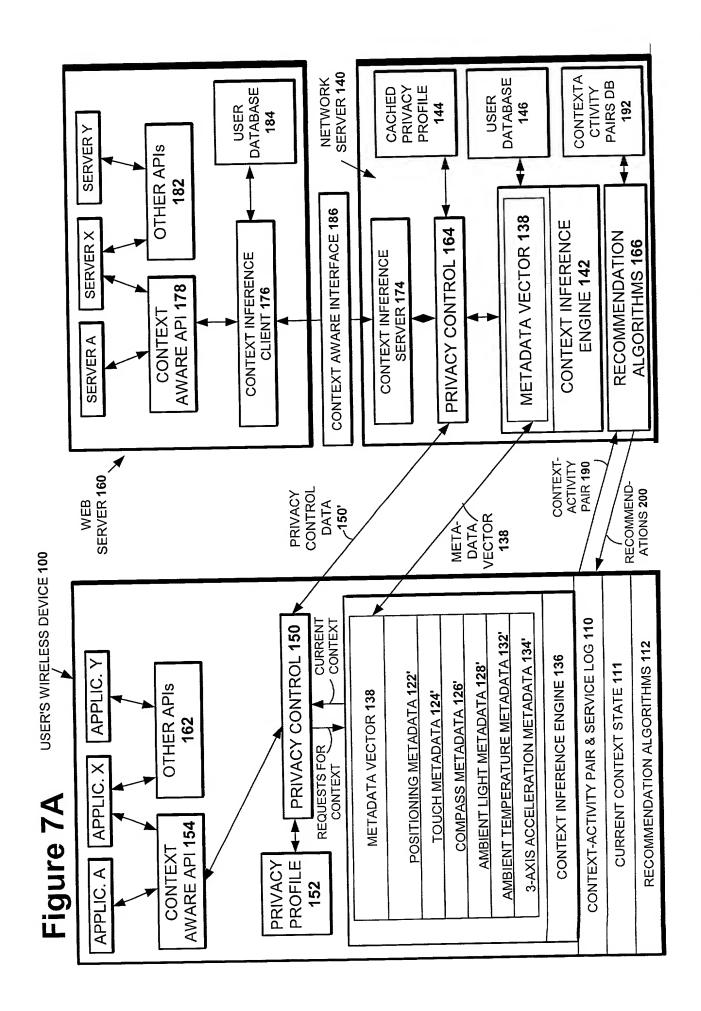
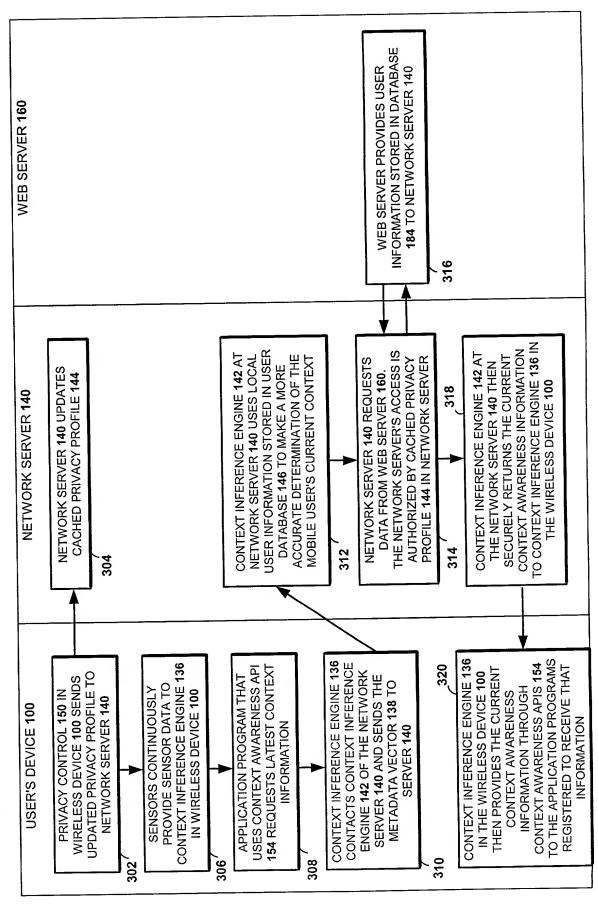


Figure 8



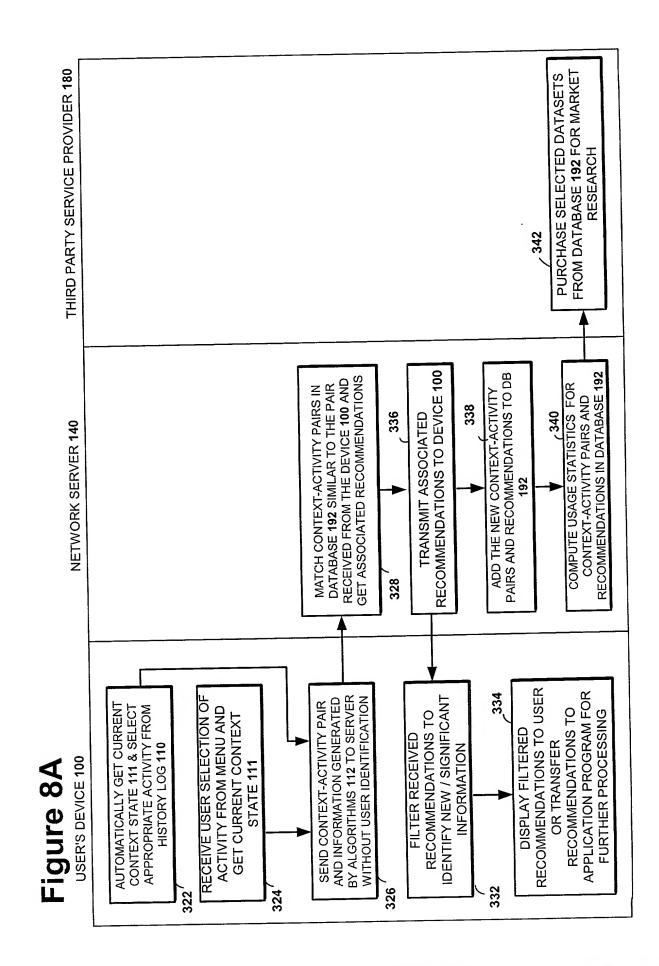


Figure 8B

	Τ-						· · · · · ·					
92 IN SERVER 140	NUMBER TIMES RECOMMENDED	R=20	R=33	R=18	R=25	R=40	R=120	R=100	R=130	R=150	R=120	
CONTEXT-ACTIVITY PAIRS AND SERVICES DATABASE 192 IN SERVER 140	SERVICE RECOMMENDATIONS	Joe's Beef Barbecue Restaurant	Elvis' Place	The Blues Diner	The Gourmet Restaurant	Dan's Fast Food Restaurant	Pancake Restaurant	Great Start Diner	Betty's Homestyle Breakfast	Mike's Quick Breakfasts	Dan's Fast Food Restaurant	
CONTEXT-ACTIV	CONTEXT-ACTIVITY PAIRS	ACTIVITY:	CONTEXT:	LOCAL LIME: 6:00 PM - 11:59 PM LOCATION: Beale St, Memphis TN	AMBIENT TEMPERATURE:	SPEED - ACCELERATION: 0 - 50 kph	ACTIVITY: DINING - restaurant	CONTEXT: LOCAL TIME: 5:00 AM - 10:59 AM	LOCATION: Beale St, Memphis TN LIGHT LEVEL: Davlight	AMBIENT TEMPERATURE: 15 C - 25 C	SPEED - ACCELERATION: 0 - 50 kph	

Figure 8C

NG = 8] ATING = 6] RECOMMEI Joe's Beef Barbe Eivis' Place The Blues Diner The Gourmet Re Dan's Fast Food Betty's Homestyl Mike's Quick Bre Dan's Fast Food	CONTEXT-ACTIVITY PAIRS	CONTEXT-ACTIVITY PAIRS AND SERVICE HISTORY LOG 110	RECEIVE BUFFER
FEXT-ACTIVITY PAIR HISTORY HISTORY OF SERVICES USED RECOMMENDATIONS FROM SERVICES USED		DEVICE 100	IN DEVICE 100
The Gournet Restaurant [USER'S RATING = 8] The Gournet Restaurant [USER'S RATING = 6] Dan's Fast Food Restaurant [USER'S RATING = 6] COATION: Beale St, Memphis TN GHT LEVEL: Night MBIENT TEMPERATURE: 15 C - 25 C PEED - ACCELERATION: 0 - 50 kph COATION: Beale St, Memphis TN Mike's Quick Breakfasts [USER'S RATING = 8] Dan's Fast Food Restaurant Dan's Fast Food Restaurant Dan's Fast Food Restaurant Dan's Fast Food Restaurant Mike's Quick Breakfasts COATION: Beale St, Memphis TN Mike's Quick Breakfasts COATION: Beale St, Memphis TN Mike's Quick Breakfasts Mike's Quick Breakfasts Dan's Fast Food Restaurant Dan's Fast Food Restaurant Mike's Quick Breakfasts Dan's Fast Food Restaurant Mike's Quick Breakfasts Dan's Fast Food Restaurant Dan's Fast Food Restaurant	CONTEXT-ACTIVITY PAIR HISTORY	HISTORY OF SERVICES USED	RECOMMENDATIONS FROM SERVER
ININING - restaurant Dan's Fast Food Restaurant [USER'S RATING = 6] Elwis Place The Blues Diner DOCAL TIME: 6:00 PM - 11:59 PM GGAT LEVEL: Night Mike's Quick Breakfasts [USER'S RATING = 8] OCAL TIME: 5:00 PM - 10:59 AM Mike's Quick Breakfasts [USER'S RATING = 8] Mike's Quick Breakfasts [USER'S RATING = 8] COCAL TIME: 5:00 PM - 10:59 AM Mike's Quick Breakfasts [USER'S RATING = 8] Dan's Fast Food Restaurant GREAT LEVEL: Daylight Mike's Quick Breakfast COCAL TIME: 5:00 PM - 10:59 AM Mike's Quick Breakfast Mike's Quick Breakfast Dan's Fast Food Restaurant		The Gourmet Restaurant [USER'S RATING = 8]	
CAL TIME: 6:00 PM - 11:59 PM CATION: Beale St, Memphis TN SHED - 25 C FEED - ACCELERATION: 0 - 50 kph Mike's Quick Breakfasts [USER'S RATING = 8] Pancake Restaurant Dan's Fast Food Restaurant Great Start Diner Betty's Homestyle Breakfast Mike's Quick Breakfasts CAL TIME: 5:00 AM - 10:59 AM GHT LEVEL: Daylight Mike's Quick Breakfasts Dan's Fast Food Restaurant Betty's Homestyle Breakfast Mike's Quick Breakfast Dan's Fast Food Restaurant	ACTIVITY: DINING - restaurant	Dan's Fast Food Restaurant [USER'S RATING = 6]	
The Gournet Restaurant Mike's Quick Breakfasts [USER'S RATING = 8] NING - restaurant CAT TIME: 5:00 AM - 10:59 AM COCATION: Beals St, Memphis TN GHT LEVEL: Daylight Mike's Quick Breakfasts [USER'S RATING = 8] Dan's Fast Food Restaurant	CONTEXT: LOCAL TIME: 6:00 PM - 11:59 PM		
Dan's Fast Food Restaurant Mike's Quick Breakfasts [USER'S RATING = 8] Mike's Quick Breakfasts [USER'S RATING = 8] Mike's Quick Breakfasts [USER'S RATING = 8] Pancake Restaurant Great Start Diner Betty's Homestyle Breakfast Mike's Quick Breakfasts Mike's Quick Breakfasts Dan's Fast Food Restaurant	LOCATION: Beale St, Meripins 11v LIGHT LEVEL: Night		
NING - restaurant Dan's Fast Food Restaurant [USER'S RATING = 8] Dan's Fast Food Restaurant Dan's Fast Food Restaurant Dan's Fast Food Restaurant NING - Restaurant Great Start Diner Great Start Diner Betty's Homestyle Breakfast Mike's Quick Breakfasts Dan's Fast Food Restaurant Dan's Fast Food Restaurant	SPEED - ACCELERATION: 0 - 50 kph		
NING - restaurant Dan's Fast Food Restaurant [USER'S RATING = 5] CAL TIME: 5:00 AM - 10:59 AM DAN - 10:59 AM SCATION: Beale St, Memphis TN GHT LEVEL: Daylight Wilke's Quick Breakfast Dan's Fast Food Restaurant Dan's Fast Food Restaurant		Mike's Quick Breakfasts [USER'S RATING = 8]	
Detty's Homestyle Breakfast CATION: Beale St, Memphis TN CHT LEVEL: Daylight GHT LEVEL: Daylight WBIENT TEMPERATURE: 15 C - 25 C Den's Fast Food Restaurant Den's Fast Food Restaurant	ACTIVITY: DINING - restaurant	Dan's Fast Food Restaurant [USER'S RATING = 5]	
Nike's Quick Breakfasts tph Dan's Fast Food Restaurant	CONTEXT: LOCAL TIME: 5:00 AM - 10:59 AM		
Dan's Fast Food Restaurant	LIGHT LEVEL: Daylight 107.16 0 26 0		
	SPEED - ACCELERATION: 0 - 50 kph		

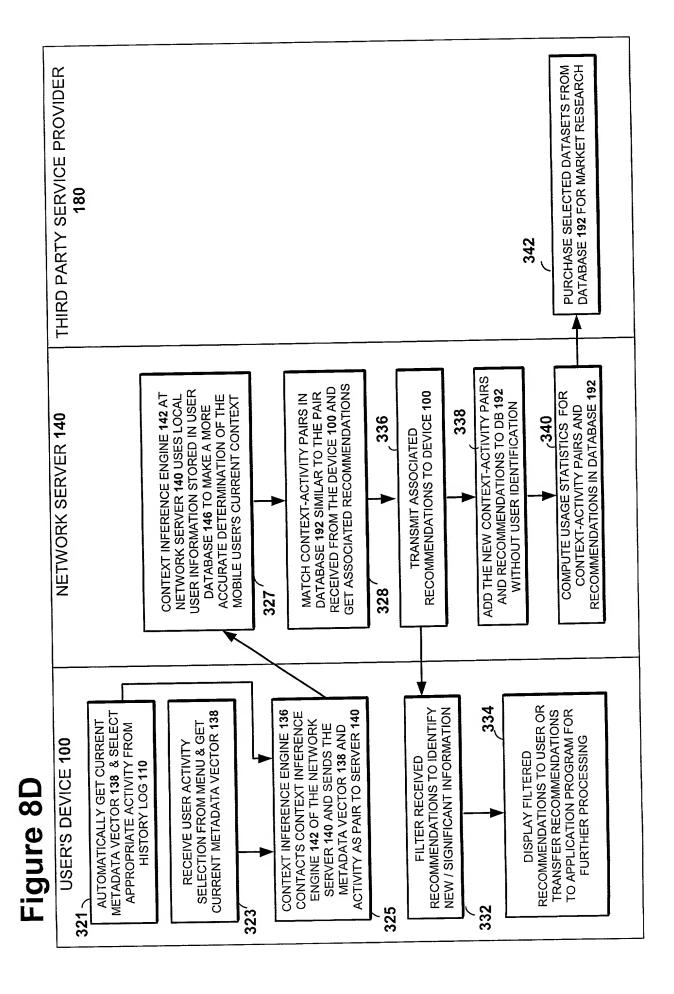


Figure 8E

